A CLINICAL STUDY OF INGUINAL HERNIA WITH COMPLICATIONS

DISSERTATION SUBMITTED FOR

BRANCH - I M.S (GENERAL SURGERY)

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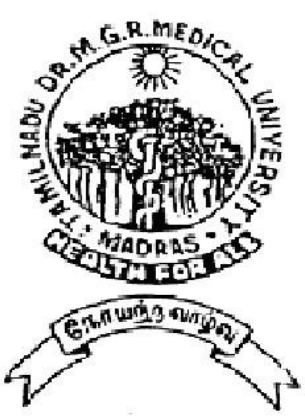

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CERTIFICATE

This is to certify that the dissertation entitled **"A CLINICAL STUDY OF INGUINAL HERNIA WITH COMPLICATIONS**" is the bonafide work of **Dr.T.V.SUBHA** in partial fulfilment of the university regulations of the Tamilnadu Dr. M.G.R. Medical University, Chennai, for M.S. (Branch I) General Surgery examination to be held in April 2013.

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DECLARATION

I , **Dr.T.V.Subha**, hereby declare that, I carried out this work on **"A Clinical Study of Inguinal hernia with Complications"** at the Department of Surgery, Government Rajaji Hospital, Madurai ,under the guidance of **Prof.Dr.M.SEKARAN M.S.,** Professor of Surgery, during the period of june2010 to December 2011. I also declare that this bonafide work has not been submitted in part or full by me or any others for any award, degree or diploma to any other University or Board either in India or Abroad.

This is submitted to the Tamilnadu Dr.M.G.R.Medical University , Chennai in partial fulfilment of the rules and regulations for the M.S. Degree Examination in General Surgery (Branch I) to be held in April 2013.

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CONTENTS

INTRODUCTION

Hernia is derived from Latin word for rupture. Hernia is defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. Although hernia can occur at various sites, their defects most commonly involve the abdominal wall. Abdominal wall hernias occur at sites where the aponeurosis and fascia are not covered by muscle.

Most abdominal wall herniation occurs in the groin (Latin word inguen) so named because it is the transition zone between abdomen and thigh. All groin hernias emerge through the myopectineal orifice of Fruchard, the opening in the lower abdominal wall, bounded by transverses abdominis arch and superior pubic ramus. The upper and lower halves divided by inguinal ligament. Inguinal protrusion presents anteriorly, femoral posteriorly.

Inguinal hernia repairs are one of the most common elective surgeries in elderly patients. In spite of the frequency of surgical repair, patients encountered with complications such as irreducibility, obstruction and strangulation. A hernia is reducible when its contents

can be replaced within the surrounding musculature and it is irreducible or incarcerated when its cannot be reduced. A strangulated hernia has compromised blood supply to its contents, which is a serious and potentially fatal complication.

AIMS AND OBJECTIVES

A number of studies have been reported to determine the outcome for predicting the development of the complications. This prospective study is to determine the risk factors and outcome of patients who were presented to our emergency surgical ward with complicated inguinal hernias.

1. To identify the risk factors for complications in inguinal hernias.
2. To find out age, sex incidence in complicated inguinal hernia.
3. To determine the side and type of hernia to be complicated.
4. To find out the site of constriction in complicated inguinal hernia.
5. To find out the duration of hernia to be complicated.
6. To determine the influence of duration of irreducibility over the viability of content.

7. To study various emergency surgical procedures in complicated inguinal hernia.

8. To find out the contributing effect of co morbid conditions on the outcome of patients with complicated inguinal hernia.

9. Using all the above said factors we can determine the patients in high risk groups who are more prone to complications and suggest them prior admission and early elective surgery.

HISTORICAL BACKGROUND

Ambroise Pare (1519-90 AD) devised trusses for the control of hernia. Also he contributed the ligature of vessels for hemostasis.

Maupassius (1559) first to operate on strangulated hernia.

Casper Stromary (16^{th} century) distinguished direct from indirect hernia, explained the importance of high dissection of indirect sac.

Antonia Scarpa (1752-1841) described sliding hernia.

Astley Cooper (1768-1841) described superior pubic ligament (cooper's ligament) , fascia transversalis.

Vesalius described inguinal ligament.

August Richter (1742-1812) described Richter's hernia, founder of first German surgical journal.

Hesselbach (1759-1816) defined iliopubic tract and importance of medial triangle of the groin.

De Gimbernat described lacunar ligament and its division during strangulated femoral hernia repair.

Marcy (1871) published original paper on antiseptic herniorraphy.

Czerny (1876) described ligating and excising the indirect sac through external ring.

Kocher suture transfixed the peritoneal sac in the lateral muscles through external ring.

Mac Ewen (1886) blocked the internal ring by reefed the peritoneal sac into a plug.

Lucas Chapionnerie opened the external oblique aponeurosis and eposed the entire inguinal canal.

Cheatle (1920) described closure of dilated deep ring.

Mosey first to describe transabdominal approach.

William.s.Halsted (1852-1922) described relaxation incision over rectus sheath.

Harvey Cushing performed herniorraphies under local anaesthesia.

George Lotheissen (1898) described cooper ligament repair and popularized by Charter McVay.

Shouldice,Obney and Pyar (1950) developed shouldice repair.

Lichtenstein (1989) introduced the concept of tension free repair using prosthetic mesh.

Nyhus described preperitoneal approach.

Gee – first laparascopic inguinal hernia repair.

Fitzgibbons & Toy (1990) – intraperitoneal onlay mesh.

Arregui (1991) – transabdominal preperitoneal approach.

Duluq (1991) – totally extraperitoneal repair.

REVIEW OF LITERATURE

"No disease of the human body, belonging to the province of the surgeon, requires in its treatment a better combination of accurate anatomical knowledge with surgical skill than hernia in all its varieties" – Sir Astley Cooper (1804).

In spite of the frequency of elective inguinal hernia repair, the complications constitute an important cause of morbidity and mortality, mainly in elderly patients.

EMBRYOGENESIS

During the sixth week of gestation, mesoderm from the myotomes on either side of the vertebral column invades the somatopleure(primitive wall of the abdomen). Around the middle of seventh week, main body of the mesodermal splits into three layers forming the three flat muscles anteriorly and serratus muscle group posteriorly. Therefore all abdominal wall muscles can be recognized around the seventh week.

The embryology of inguinal canal is peculiar. In highly synergistic way, the skin, parietal peritoneum, embryological and anatomical entities between them produce the pathway for the testes.

The skin will form the scrotum in male and labia in female. The parietal peritoneum will produce processus vaginalis. In male fetus, this peritoneal diverticulum is more important because it will permit the descent of the testicles. The embryological entities between the skin and peritoneum permit the processus vaginalis to penetrate them and form the inguinal canal. Then descent of the testicles is thus allowed. Descent of the ovary outside of peritoneal cavity however is forbidden. The processus vaginalis finally close to obstruct ovarian exodus but leaves the formation of inguinal canal in situ.

The testis starts to descent by the 3rd month of gestation and complete the descent by 9th month. By ninth month the testis entered the scrotal sac and gubernaculum is reduced to small band attaching the inferior pole of testis to the scrotal floor. The processus vaginalis is usually obliterated, leaving a distal remnant sac, tunica vaginalis covers the testis. In females, the ovaries desend into the pelvic cavity round ligament is the only remaining structure passing through the inguinal canal, which is remnant of gubernaculum. If obliteration of processus vaginalis does not occur or incomplete, an indirect inguinal hernia may develop.

ANATOMY OF GROIN

Anatomy of the inguinal region is complex. The multiple entities joining to form the supportive foundation to the inferior anterolateral abdominal wall as it attaches to the pubic tubercle, pelvic rami and anterior superior iliac spine. Four groin hernias are encountered in this region; indirect inguinal, direct inguinal, external supravesical and femoral. All of this originates from the myopectineal orifice of Fruchard, the opening in the anterior abdominal wall. To understand these hernias and the formation of the rings, knowledge of anatomy of the groin and inguinal canal is essential.

LAYERS OF ANTERIOR ABDOMINAL WALL IN THE INGUINAL REGION

a. skin

b. superficial fascia

c. innominate fascia(Gallaudet)

d. external oblique aponeurosis

e. spermatic cord in males and round ligament in females

f. transversus abdominis muscle and aponeurosis

g. anterior layer of transversalis fascia

h. posterior layer of transversalis fascia

i. preperitoneal connective tissue and fat

j. peritoneum

SKIN AND SUPERFICIAL FASCIA

Skin is loosely adherent to the underlying structures except at umbilicus. The superficial fascia is divided into superficial fatty layer known as fascia of Camper and deep membranous layer known as fascia of Scarpa. The fatty layer continues downwars and laterally into the thigh, gluteal region and perineum, upward over the anterior abdominal wall and thoracic region. The Scarpa's fascia continues upward with fatty layer in the pectoral region, downwards it attaches to the fascia lata of thigh below the inguinal crease, superolaterally to the iliac crest. According to Brantyan, scarpa's fascia does not adhere to the pubic symphysis.

DEEP FASCIA

The deep muscular fascia of the anterior abdominal wall also known as fascia innominate or Gallaudet's fascia, this tough fascial layer is continous over the superficial musculature. Together with tough connective tissue from the lowest extent of rectus sheath this layer forms the suspensory ligament of the penis or clitoris.

EXTERNAL OBLIQUE APONEUROSIS

It extends downwards and medially to continuous as anterior rectus sheath, here it joins the internal oblique aponeurosis and transversus abdominis aponeurosis. The innominate fascial covering of external oblique muscle travels downwards and forms the external spermatic fascia of the spermatic cord. The lower border of external oblique aponeurosis, suspended between anterior superior iliac spine and the pubic tubercle is termed as inguinal ligament.

Superficial inguinal ring is the triangular opening in the external oblique aponeurosis. It is bounded by the crura. The superior crus inserts into the anterior surface of the tubercle, pubic bone and symphysis. The inferior crus inserts into the tubercle and pubic pectin,

impact by way of lacunar ligament. Superior crus crosses the midline to insert into the pubic tubercle.

TRANSVERSUS ABDOMINIS ARCH

It is formed by the free aponeurotic and muscular lower margin of the muscle. Medially the arch is principally aponeurotic. Toward the internal ring, it is both muscular and aponeurotic. The transverses abdominis muscle inserts on cooper's ligament. Mc Vay stated the transversus abdominis is the most important layer of the abdominal wall and its integrity prevent the formation of hernia.

TRANSVERSALIS FASCIA

It is the connective tissue sheet lining the parietal musculature of the abdominal cavity. It covers muscle, aponeurosis, bones and ligaments. The transversalis fascia may be closely adherent such as the transversus avdominis aponeurosis, located between the peritoneum and posterior wall of transversus abdominis muscle anteriorly. It upwards continuation blends with inferior diaphragmatic fascia. Downward it continues with iliac and pubic fascia, posteriorly fuses with thoracolumbar fascia. A posterior wall defect is found in

23 to 25% of patients. Therefore transversalis fascia is ths only anatomic entity contributing to the continuity of floor.

ANATOMY OF INGUINAL CANAL

It is an oblique canal of about 4cm in length, lies just above the medial half of inguinal ligament, created by passage of spermatic cord or round ligament in male and females respectively, which extends from deep inguinal ring to superficial inguinal ring.

SUPERFICIAL INGUINAL RING

It is a triangular defect in external oblique aponeurosis which lies just above and lateral to pubic tubercle. The ring is bounded by crural fibres. The spermatic cord emerges through it and lying lateral to pubic tubercle.

SECONDARY SUPERFICIAL INGUINAL RING

It arises from the membranous layer of superficial fascia of the anterior abdominal wall below the classical superficial ring. It is a tube like arrangement of scarpa's fascia, which constitutes the entrance into the scrotum. Adhesive obstruction, under development or congenital absence of the secondary external ring has been

considered responsible for some cases of incomplete testicular descent or testicular atropy. When a hernia passes the secondary superficial ring it becomes scrotal.

DEEP INGUINAL RING

It is a 'U' shaped opening in the fascia transversalis midway between anterior superior iliac spine and symphysis pubis, just lateral to inferior epigastric artery. The arms are called as crura. The superior crus is attached to the transversus muscle by fascial slips so that when that muscle contracts, the internal ring is drawn laterally, increase the obliquity of the exit.

SECONDARY DEEP INGUINAL RING

In 1975 Fowler described second deep ring arises from the membranous layer of the extraperitoneal fascia located deep to the transversalis fascia. In males, the vas deferens hooks around inferomedial lip of second deep inguinal ring to enter the inguinal canal. The gonadal vessels, which lie lateral to vas deferens also traverse the second deep inguinal ring to enter the inguinal canal.

The second deep inguinal ring has important applications to surgery of the inguinal canal. During repair of an indirect inguinal hernia, the level of sac ligation should be at second deep inguinal ring. While performing inguinal or preperitoneal approach the internal spermatic fascia should be incised for exposure of the second deep inguinal ring.

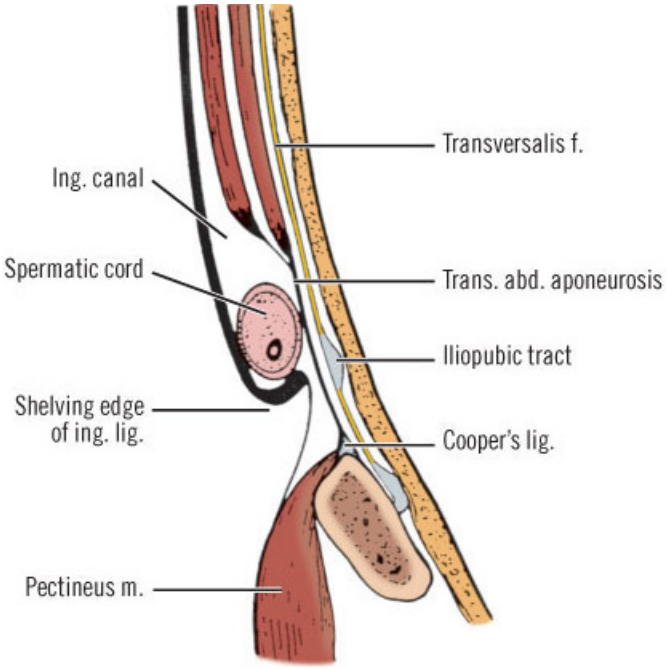
BOUNDARIES OF INGUINAL CANAL

ANTERIOR – skin, superficial fascia, external oblique aponeurosis in its whole extent, lateral 1/3rd by fleshy fibers of internal oblique muscle.

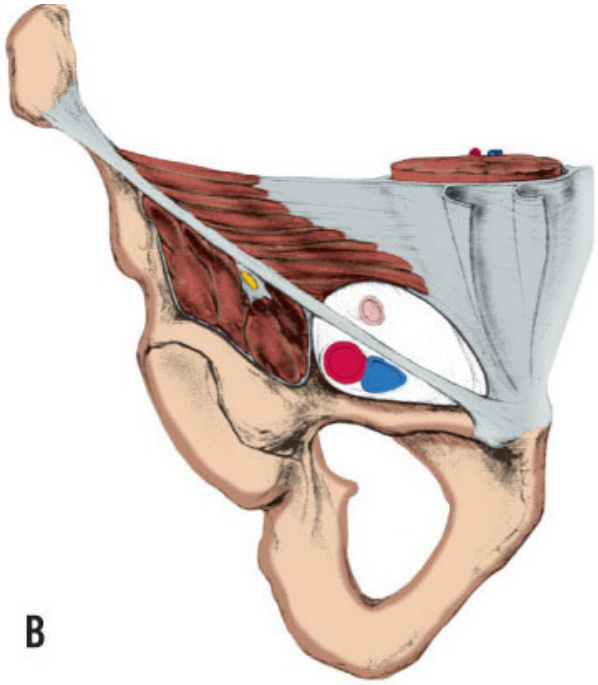
POSTERIOR – transversalis fascia and aponeurosis of transversus abdominis muscle along the whole length, medially by conjoined tendon and reflected part of inguinal ligament.

ABOVE – arched fibers of internal oblique and transversus abdominis muscle.

BELOW – upper surface of inguinal ligament, lacunar ligament at medial end.



BOUNDARIES OF INGUINAL CANAL



MYOPECTINEAL ORIFICE

CONTENTS OF INGUINAL CANAL

In males the contents are spermatic cord, ilioinguinal nerve, lymphatics, and remnants of processus vaginalis.

Spermatic cord contains vas deferens,

Three arteries -testicular artery, cremastic artery, artery to vas deferens,

Three veins- pampiniform plexuses of veins, cremastic vein, deferential vein

Three nerves- genital branch of genitofemoral nerve, and sympathetic fibres from hypogastric plexus, ilioinguinal nerve and concentrically invested by three layers of tissue external spermatic fascia derived from external oblique fascia, cremastic derived from internal oblique muscle and fascia, internal spermatic fascia derived from transversalis fascia

The contents of the spermatic cord relate to each other as follows: pampiniform plexus lies anteriorly, ductus deferns and remnant of processus vaginalis or hernia sac lies posteriorly.

In females instead of spermatic cord round ligament is present.

ILIOINGUINAL NERVE enters the canal in between the external and internal oblique muscles. It passes out through the external inguinal ring.

IMPORTANT ANATOMICAL STRUCTURES

There are some structures that are important to the conceptualization of inguinal canal which include inguinal ligament, cooper's ligament, iliopubic tract, lacunar ligament and conjoined area.

INGUINAL LIGAMENT

It is formed by the lower border of external oblique aponeurosis. It extends from anterior superior iliac spine to pubic tubercle. Fascia lata attaches to its lower border and makes a convexity downwards (poupart's ligament). It gives origin to internal oblique, transverses abdominis as well as sturdy structure used in various hernia repairs.

LACUNAR LIGAMENT (GIMBERNAT LIGAMENT)

It is formed by the triangular fanning out of inguinal ligament as it joins the pubic tubercle. It forms the medial end of femoral canal.

COOPER'S LIGAMENT (PECTINEAL LIGAMENT)

It considered as formed by lateral portion of lacunar ligament fused to periosteum of pubic tubercle and also includes fibers from transversus abdominis, internal oblique, iliopubic tract and rectus abdominis.

CONJOINED AREA

It is described as fusion of inferior fibers of internal oblique and transversus abdominis aponeurosis, at the point where they insert on pubic tubercle. More likely it is a combination of transversus abdominis aponeurosis, transversalis fascia, lateral edge of rectus sheath and internal oblique muscle.

ILIOPUBIC TRACT (THOMSON'S LIGAMENT)

It is formed by thickened lower part of transversalis fascia stretches from anterior superior iliac spine to pubic tubercle. It lies posterior to inguinal ligament. It forms the inferior border of internal

ring, bridges across the femoral vessels and reinforces anterior margin of femoral sheath.

LIGAMENT OF HENLE (FALX INGUINALIS)

It is the lateral vertical expansion of the rectus sheath inserts on the pectin of the pubis. The ligament is present in the half of patient and is fused with transversus aponeurosis and fascia.

HESSELBACH'S LIGAMENT (interfoveolar ligament)

It is formed by the thickening of the transversalis fascia at the medial side of internal ring.

COLLE'S LIGAMENT

It is formed by reflected part of inguinal ligament consist of aponeurotic fibers from the inferior crus of the external ring that extends to the linea alba.

HESSELBACH'S TRIANGLE

It is described by hesselbach's in 1814. The boundaries of this triangle are

Medially – lateral border of rectus sheath

Laterally – inferior epigastric vessels

Inferiorly – inguinal ligament

Floor – fascia transversalis

Most direct inguinal hernias and external supravesical inguinal hernias occur in this site.

MECHANISMS WHICH PREVENT HERNIA IN THE INGUINAL REGION

1. SHUTTER MECHANISM

During rise of intra-abdominal pressure, contraction of internal oblique and transversus abdominis will cause the roof to be approximated to the floor.

2. FLAP VALVE MECHANISM

The rise in intra abdominal pressure will cause approximation of anterior and posterior walls and thus prevents entry of abdominal content into the inguinal canal.

3. SLIT VALVE MECHANISM

Superficial ring is bounded by crural fibers derived from external oblique aponeurosis. So contraction of external oblique approximates the crural fibers and closes the superficial ring like slit valve.

Deep inguinal ring is bounded by crural fibers derived from transversalis fascia. When transversus abdominis contracts it pulls the transversalis sling and close the deep inguinal ring around the cord, pull the deep ring superiorly and laterally.

4. BALL VALE MECHANISM

   Contraction of cremastic muscle pulls the spermatic cord into the canal during rise in intra abdominal pressure.

5. In front of Hesselbach's triangle there is strong conjoint tendon to prevent direct inguinal hernia

6. In front of deep inguinal ring, strong fibers of internal oblique present which prevents entry of abdominal content into deep inguinal ring.

AETIOLOGY

Mainly two factors play a main role in causing hernia.

1. weakness of abdominal muscles.
2. increased intra abdominal pressure

WEAKNESS OF THE ABDOMINAL MUSCULATURE

A. Congenital weakness

1. Persistence of processus vaginalis.
2. Patent canal of nuck in female.

B. Acquired weakness

1. Excessive fat in the abdomen causes weakness of abdominal musculature.
2. Repeated pregnancy may cause muscle weakness.
3. Direct hernia may develop following appendicectomy due to division of ilioinguinal nerve.
4. Smoking, aging may cause destruction of connective tissue.

INCREASED INTRA ABDOMINAL PRESSURE occurs in following conditions

- Chronic cough in bronchitis, tuberculosis etc.
- Straining on micturation or daefecation
- Intrabdominal tumors, ascites
- Straining during lifting heavy weight.

COMPOSITION OF HERNIA

Sac, contents of sac, coverings of sac.

SAC is divided into four parts – mouth, neck, body, fundus.

Mouth – through which contents enter the sac.

Neck – most constricted part, strangulation of bowel is likely to occur when the neck is narrow.

Body – main portion of the sac.

Fundus – most redundant part of the sac.

CONTENTS

The viscus which lies within the sac is called as content of hernial sac.

Depends upon the content, hernia is variously named

Named hernias	**Content of the sac**
Omentocele or epiplocele	Omentum
Enterocele	Loop of intestine
Richter's hernia	Portion of circumference of intestine
Littre's hernia	Meckel's diverticulum
Maydl's hernia	Two loops of intestine remain in the Manner of 'W'
Amyand's hernia	Appendix

CLASSIFICATION OF INGUINAL HERNIA

Effective inguinal hernia classifications should provide the following:

- To determine the most appropriate repair.
- Serve as an anatomic blue print for the dissection
- To compare the results of various methods of repair
- And to correlate postoperative results, duration of convalescence

Based on etiology can be classified into

1. Congenital – when a preformed sac was present congenitally i.e. presence of incompletely or completely unobliterated processus vaginalis. A congenital hernia becomes complete within a short period of its appearance.
2. Acquired – when there was no preformed sac and the sac acquired later in life. Whereas an acquired hernia progresses gradually and usually fails to complete.

According to the site of exit of sac, classified into

1. Indirect inguinal hernia – Through deep ring
2. Direct inguinal hernia – Through defect medial to the inferior epigastric artery.
3. Pantaloon hernia – both direct and indirect.

Based upon the extension of sac, hernia classified into

1. Bubonocele : sac upto superficial ring.
2. Incomplete hernia : sac upto upper part of epididymis.
3. Complete hernia : sac upto bottom of scrotum.

Based upon clinical presentation, hernia can be divided into

1. Reducible.
2. Irreducible.
3. Obstructed.
4. Strangulated

CLASSIFICATION OF GROIN HERNIA

Comprehensive review by Red and Rutkow and Robbin's summarize historical background, as well as the surgical observations created the current traditional classification of groin hernias as direct inguinal, indirect inguinal and femoral hernia. Over the past four decades, more number of classifications has evolved in attempt to precisely describe inguinal hernias. In general, these newer classifications have focused on anatomic location of the defect and loss of functional integrity for various openings or spaces in the inguino-femoral region.

HARKIN'S CLASSIFICATION (1950)

Grade I - indirect infant hernias

Grade II - simple indirect hernias in older children and young healthy adults.

Grade III - intermediate type of hernia, large indirect inguinal hernias in young adults or small hernias in older patients with strong tissue, few small direct inguinal hernias with narrowed neck sac.

Grade IV - recurrent, femoral, direct and indirect not specified in grade II and III.

CASTEN (1967) staged hernia into three categories

Stage I - indirect hernias in infants and children with a normally functioning internal ring.

Stage II - large indirect hernia with distorted internal ring

Stage III - direct and femoral

HALVERSON AND MCVAY CLASSIFICATION (1970)

Type I - small, indirect one of childhood

Type II - medium sized, indirect that had dilatation of internal ring without disruption of posterior inguinal wall in the indirect floor area.

Type III - direct, indirect hernias with destruction of the posterior inguinal floor in the direct area.

Type IV - femoral hernia

Type V - combined, any mixture of above

LICHTENSTEIN (1987) classified direct hernia into five categories

Type I - entire direct floor

Type II - lateral half of direct floor

Type III - medial half of direct floor

Type IV - diverticular

Type V - others

He didn't use the term combined hernias. Instead, he listed as principal and secondary hernias, thus he able to describe multiple or coexisting hernias.

GILBERT (1980) CLASSIFICATION

Type I - indirect hernia with ‘snug internal ring’

Type II - moderately enlarged internal ring, the hernia opening is less than two fingerbreadths in width and direct floor is intact.

Type III - enlarged internal ring of two fingerbreadths or greater

Type IV - direct hernias that either a very large one or involve disruption of entire direct floor. Internal ring area is still intact.

Type V - direct hernias are diverticular defects of no more than one fingerbreadth in the direct floor, in the presence of an intact indirect inguinal ring

RUTKOW and **ROBBINS** expanded this classification in 1993 with addition of type VI and VII.

Type VI - pantaloon or combined

Type VII - femoral

NYHUS CLASSIFICATION

Type I - indirect hernia with internal ring of 'normal size, configuration and structure' occurs in infants and young adults. The hernia sac is contained within the inguinal canal and the direct floor is intact

Type II - indirect hernia with 'enlarged and distorted' internal ring without disruption or encroachment into direct floor area, in this hernia sac can occupy entire inguinal canal but it does not entered into the scrotum.

Type IIIA - all direct hernias wherein 'the protrusion does not herniated through the internal ring'

Type IIIB - large indirect where the defect has 'expanded medially and encroaches on the posterior inguinal wall, the sac is often inguino-scrotal, sliding and pantaloon hernia

Type IIIC - femoral

Type IVA - recurrent direct

Type IVB - recurrent indirect

Type IVC - recurrent femoral

Type IVD - combination of A, B or C

STOPPA modified **NYHUS** classification system by adding "aggravating factors" which essentially upstage each Nyhus type by one, example Nyhus type I hernia with aggravating factors become Stoppa type II.

AGGRAVATING FACTORS INCLUDE

1. General factors – massive obesity, abdominal distention, collagen defect
2. Local factors – voluminous, multiple or complex hernias
3. Complex injuries related to the hernia, its size, degree of sliding, multiplicity etc.
4. Patient factors – age, activity, respiratory distress, dysuria or constipation
5. Special surgical circumstances – technical difficulties, infection risk.

BENDAVID CLASSIFICATION (1994)

He classified hernias based on anatomic area, size of hernia defect, length of sac. He named this as TSD (type, stage, and dimension)

Bendavid used four anatomic regions in the groin for typing. In relation to epigastric vessels he divide inguinal region into medial and lateral, above (anterior) or below (posterior) in relation to the inguinal ligament.

Type I - anterolateral (indirect)

Type II - anteromedial (direct)

Type III - posteromedial (femoral)

Type IV - posterolateral (perivascular)

Bendavid staging reflect the degree of descent for the hernia sac.

Type I - sac is contained in the inguinal canal

Type II - sac extended outside the external ring but has not entered the scrotum

Type III - sac is in the scrotum

The dimension criteria measure the diameter of the abdominal wall defect in centimeters.

Additionally Bendavid included several modifiers after type such as ‘R’ for recurrence, ‘S’ for sliding, ‘I’ for incarcerated, ‘N’ for necrosis.

SCHUMPELICK AND ARIT (1995) published **AACHEN CLASSIFICATION**

Quantification of the defect size to the traditional classification terms

Defect size: Grade I < 1.5 cm

Grade II 1.5 – 3 cm

Grade III > 3 cm

L : lateral (indirect)

M : medial (direct)

F : femoral

ZOLLINGER proposed 'UNIFIED CLASSIFICATION'

Grade I - intact inguinal ring with a small sac that may stay reduce on occasion

Grade II - medium size indirect hernia with enlarged internal ring up to two fingerbreadth in diameter, sac usually in the canal

Grade III - large indirect hernia, sac usually extends into the scrotum

Grade IV - small direct appears as a fifth finger sized porthole in a direct floor

Grade V - medium direct hernias has a thumb sized defect

Grade VI - large direct hernia has blown out the entire direct floor

Grade VII - pantaloon

Grade VIII – femoral

O - category of other, such as massive inguinal hernia or prevascular hernia

COMPLICATED INGUINAL HERNIAS

IRREDUCIBLE HERNIA

When the contents of hernia cannot be reduced back into the abdomen, without evidence of other complications.

Various causes of irreducibility

1. dense chronic hernia sac adheres to its content
2. adhesion of its contents to each other
3. sliding hernia
4. presence of omentum in the sac often causes irreducibility
5. very large scrotal hernia

Irreducible hernia may lead to obstruction, strangulation, in these conditions emergent inguinal hernia repair is indicated.

OBSTRUCTED HERNIA

Irreducible hernia associated with intestinal obstruction due to occlusion of lumen without interference to bowel blood supply.

Clinical features are hernia is irreducible, cough impulse is absent. Patient may not complain of pain with features of intestinal obstruction. The term incarcerated hernia is often used as an alternative to obstructed hernia, but more precise it indicates colon as content and is blocked with faeces.

STRANGULATED HERNIA

Incidence of strangulation in inguinal hernia is upto 5%. A hernia is said to be strangulated when the blood supply to its content is impaired and the content becomes gangrenous. Femoral hernia is more likely to be strangulated when compare to inguinal hernia, indirect variety strangulate more common than direct variety.

PATHOLOGY

Initially due to constriction in neck of sac intestinal obstruction ensures and intestine starts dilating, venous return is impeded first which results in congestion of intestine. As venous stasis increases arterial supply is also impaired. Extravasation of blood takes place, entered into lumen as well as sac fluid.

The serous layer becomes dull and covered with fibrinous exudates. Gradually intestine loses its tone and feels flabby. The viability of intestine diminishes which favours migration of bacteria from lumen into intestinal wall and fluid within the sac. So the sac fluid contains bacterial toxins. Thrombosis of mesentry vessels occurs. First gangrene appears at site of constriction and progress to antimesentric border of the intestine. Gangrene may occur as early as 5 to 6 hours after the occurrence of first symptom of strangulation. If strangulation persists, perforation of intestinal wall occurs. Finally peritonitis will result.

CLINICAL FEATURES

Patient first complaints of pain in hernia site, which then spreads all over the abdomen. Forcible and frequent vomiting ensures. If strangulation is not relieved, pain continues. The onset of gangrene and paralytic ileus will cease the pain. So spontaneous cessation of pain is an ominous symptom in case of strangulated hernia. On examination patient is seriously ill. Hernia is tender, tense, irreducible, no impulse on coughing associated with features of intestinal obstruction.

STRANGULATED OMENTOCELE

Patient presents with pain located to hernia site but generalized abdominal pain is absent. And also there is no feature of intestinal obstruction. Omentum can withstand meager blood supply for long time, so gangrene occurs lately. Gangrene first occurs in distal part of omentum followed by infection. Such infection may even cause scrotal abscess.

STRANGULATED RICHTER'S HERNIA

Patient presents with clinical features mimics gastroenteritis. Vomiting is not that much frequent as intestinal strangulation. Features of intestinal obstruction sets in when half of the circumference of bowel is involved. Patient may present with diarrhoea. Absolute constipation develops when paralytic ileus supervenes. Gangrene of bowel knuckle and peritonitis often occurs before surgery.

TREATMENT

- Emergency operation is the treatment of choice.
- As soon as the admission, patient should be properly resuscitated.
- Administration of i.v fluids to correct dehydration and electrolyte imbalance.
- Nasogastric tube is introduced to decompress the gastric contents.
- Parenteral antibiotics to prevent septicemia.
- Prepare the patient for emergency exploration.

“ The danger is in the delay not in the operation”, Sir Astley Cooper said. Surgery should not be delayed in moribund patients.

TAXIS

It can be tried in patients with irreducible hernia without signs of strangulation.

METHOD

Patient is sedated and made to lie down in trendelenburg position. Patient's thigh is flexed, adducted and internally rotated. The fundus of sac is gently squeezed with one hand and the contents of sac are direct into superficial inguinal ring with the other hand.

Vigorous manipulation may lead to following complications:

1. Contusion or rupture of intestinal wall.
2. Reduction into loculus of the sac.
3. The sac together with its content is reduced into the abdomen, but the content within the sac remains strangulated i.e reduction en masse. The symptoms are not relieved.
4. The sac may rupture at its neck, contents are reduced extraperitoneally.

SURGERY FOR COMPLICATED INGUINAL HERNIA

ANAESTHESIA:

General anaesthesia is preferable, if patient's condition permits.

STEPS:

1. Inguinoscrotal incision is routinely used.
2. Various layers covering the sac is incised and sac is delivered out.
3. Sac is opened first near fundus before the constriction is relieved, to prevent the contamination with toxic fluid. And also for thorough examination of the contents of sac.
4. The constriction may be present at 1) superficial inguinal ring 2) deep inguinal ring 3)midway between superficial and deep inguinal ring 4) anywhere along the sac
5. Using finger as a guide, constriction is slit open. While releasing the constriction at deep ring, course of the inferior epigastric artery should be kept in mind. To avoid injury to this vessel constriction ring is divided parallel to it.

6. Viability of bowel should be checked. The following points indicate non viability of bowel:

    - Greenish or blackish in color

    - Flaccid and lusterless bowel with mesenteric vessel thrombosis

    - Peristalsis is absent.

7. Hot wet mops are placed on the involved bowel and reassure for viability of bowel by checking return of pink color, peristalsis and temperature.

8. When the involved bowel is viable, it can reduce into the peritoneal cavity and proceeded with herniorraphy.

9. If bowel is non viable, proceed with resection and anastamosis. Whenever needed we can convert the procedure into laparotomy.

10. Herniorraphy is done by modified bassini's repair or by darning.

11. Lichtenstein's tension free mesh repair can be done in strangulated hernia to strengthen posterior wall in clean cases.

DARNING REPAIR

This procedure was originally described by Moloney. The principle behind this repair is that the lattice work of suture provides tension free repair.

First the defect in the transversalis fascia is sutured without tension. Second part involves darn repair. In this repair, transversalis fascia is not split open. After ligation of indirect sac or inversion of direct sac, the posterior wall is repaired. The repair involves continuous suturing starting from just medial to internal ring. The conjoined tendon is sutured to the inguinal ligament with no tension.

The second suture line starts from the pubic tubercle by taking strong aponeurotic tissue from rectus sheath, conjoined tendon above to inguinal ligament below in continuous fashion. The suture lattice instead works as a darn mesh.

Abrahamson modified this technique by starting the repair from medial side with an anchoring suture to pubic fascia along with inguinal ligament, transversalis fascia, and transversus abdominis aponeurosis. Then using nylon simple continuous suture is done by suturing iliopubic tract, few fibers of inguinal ligament and lower

portion of transversalis fascia to upper portion of transversalis fascia and lower edge of transversus abdominis aponeurosis.

In case of direct hernia, 1-3 bites are taken to close the defect in transversalis fascia. For the darn part of repair, three nylon sutures are placed in continuous fashion, inferiorly includes inguinal ligament, superiorly rectus sheath and conjoined tendon. There is no tension placed on the sutures. The first suture is in vertical direction, second in craniomedial direction, third slopes cranially and laterally.

MODIFIED BASSINI'S REPAIR

Bassini was first to understand and develop an anatomical repair of inguinal hernias. The original bassini repair includes the resection of cremastic muscle for good exposure of posterior wall of inguinal canal, and also he divided the transversalis fascia from pubis tubercle to beyond deep ring. He has done high ligation of an indirect sac in the preperitoneal space. He reinforced posterior wall with a single row of interrupted non absorbable sutures by suturing internal oblique muscle, transversus abdominis muscle and upper leaf of transversalis fascia (triple layer) to lower leaf of transversalis fascia and inguinal ligament (double layer).

The modified bassini repair do not includes the division of transversalis fascia or removing of cremastic muscle. It only includes ligation of indirect sac and suturing the conjoined tendon to inguinal ligament using non absorbable material in interrupted fashion.

LICHTENSTEIN'S TENSION FREE MESH REPAIR

It was originally described by Newman, but the anterior flat mesh repair was popularized by Lichtenstein in 1980's. The posterior wall is strengthened using polypropelene mesh. A mesh is placed over posterior wall; inferior border is sutured to inguinal ligament in continuous fashion, extending lateral to deep ring. The mesh is sutured to cooper's ligament if femoral hernia is suspected. In lateral part of mesh slit is made to wrap around the cord like fish tail. The upper and lower tails are fixed with suture to posterior wall lateral to deep ring for a 'shutter mechanism' effect.

The reconstructed internal ring should be snug, but not tight. The superolateral border is fixed to aponeurotic arch and the superomedial border to the rectus sheath. The mesh should overlap good fascia by at 2 cm. The current size of mesh that is recommended

is 7.5×15 cm. The other thing is that mesh should not stretch out too tightly to avoid tension.

ROLE OF LAPAROSCOPY IN EMERGENCY HERNIA REPAIR

Recent studies explain the role of laparoscopy in emergency hernia repair. Using laparoscopy, we can judge the viability of bowel and we can prevent unnecessary laparotomies (M.I.Lavonius 2000).

Laparoscopic reduction and repair of obstructed inguinal hernia was useful and it avoids unnecessary bowel resection (T.Ishikau 1996). TAPP approach appears to be good therapeutic option for strangulated hernia (Rebufatt 2006, G.L.Legnani 2008) but it requires adequate laparoscopic training. Exclusion criteria are contraindications for anaesthesia and dimensional criteria of the hernia (G.L.Legnani 2008).

COMPLICATIONS ASSOCIATED WITH HERNIA SURGERY

SEROMA

Loculated fluid collection is more commonly seen following large hernia repairs and after using prosthesis. In the case of large hernia repair, the potential space remains in the defect fill with

physiological fluid. Seroma usually develops within first week; patient may perceive it as recurrence. On examination, compressible bulge in the groin or scrotum is demonstrable. Warm compression may be helpful. Aspiration should be avoided, it may introduce the infection.

HEMATOMA

On examination, localized collection or diffuse bruising over the operation site is present. In scrotal hematoma drainage is more difficult. Blood gets into many tissue levels of scrotum and is difficult to evacuate.

WOUND INFECTION

Inguinal hernias are subject to a low wound infection rate; there is no apparent difference in wound infection rates when compared between with and without antibiotic prophylaxis in large number of studies. Recent Cohrane Database studied 6705 patients to demonstrate effectiveness of prophylactic antibiotics in reducing postoperative wound infection in elective open hernia repair. The patients treated with mesh prosthesis reported with wound infection rates of 1.4 and 2.9% respectively. Wound infection is managed with

antibiotics. Incision and drainage may be required in case of failure of medical line of treatment.

PAIN

Postherniorraphy pain syndrome may be due to somatic, visceral or nerve involvement.

Somatic pain is due to damage to ligaments, muscles. This type of pain aggravates with exertion and movement of the abdominal wall. It is treated with rest, NSAIDS and reassures the patient.

Visceral pain may result from injury to sympathetic plexus. This type of pain experienced during visceral function such as ejaculation.

Neuropathic pain is localized sharp pain that may produce a sensation of burning or tearing. It indicates direct nerve damage or entrapment. Conservatively it can managed with NSAIDS, nerve directed injection of steroids and anaesthetics. If there is no response to conservative management neurectomy may be done at deep inguinal ring level. Chronic pain lasts beyond 3 months, results from secondary to nerve entrapment, scar tissue or mesh adherence. The

ilioinguinal nerve is at increased risk to injury while closure of external oblique aponeurosis. In mesh repair, both ilioinguinal and iliohypogastric nerve may become entrapped within mesh. Regardless of etiology or specific nerve injury patients usually presents with localized pain, parasthesia or numbness over the cutaneous distribution of the affected nerve.

MATERIALS AND METHODS

Rajaji Government Hospital is a tertiary care centre in Madurai. It has more number of patients in emergency surgical ward. Hernia is one of the most common surgical problems presenting to our outpatient department. In spite of this, there are also patients presenting with complicated inguinal hernia to emergency surgical ward. This study was planned as a prospective observational study. The purpose of this study is to determine the various risk factors influence the development of complications in inguinal hernia and also the outcomes of the patients.

Duration of study was from June 2010 to December 2011.

INCLUSION CRITERIA

- All patients with complicated inguinal hernia attending the emergency surgical ward at Rajaji Government Hospital, Madurai.
- The diagnosis was made clinically.

EXCLUSION CRITERIA

Patients who were presenting with irreducible hernia, after sedation or under anaesthesia the hernia were reduced.

DATA COLLECTION

Age

Sex

Side of hernia

Type of hernia

Site of constriction

Duration of hernia

Duration of irreducibility

Type of surgery

Contents of sac

Comorbid conditions

METHODOLOGY

Diagnosis of complicated inguinal hernia was made by history taking and clinical examination. Certain important clinical factors were tabulated and analyzed.

Abdominal pain

Bowel disturbances – vomiting, constipation, obstipation

Abdominal distention

Tenderness

All complicated inguinal hernia patients were undergone basic blood investigations, chest X-ray, and abdomen X-ray erect view. All symptomatic patients were assessed for emergency surgery and consent was obtained from the patient and patient's relative.

PREOPERATIVE PREPARATION

- I.V.fluids was administered to correct dehydration and electrolyte imbalance.
- Nasogastric tube was inserted for continuous aspiration.

- Single dose of injection cefotaxim 1g i.v. was given prophylaticaly.
- Patient's part were shaved and cleaned properly.

OPERATIVE PROCEDURE

Under general or spinal anaesthesia, inguinoscrotal incision was made and preceded. The site of constriction, contents of sac, viability of contents was noticed. Depending on the findings appropriate procedure was done. Hernia repair was done using darning, modified bassini's repair or Lichtenstein's tension free hernia repair.

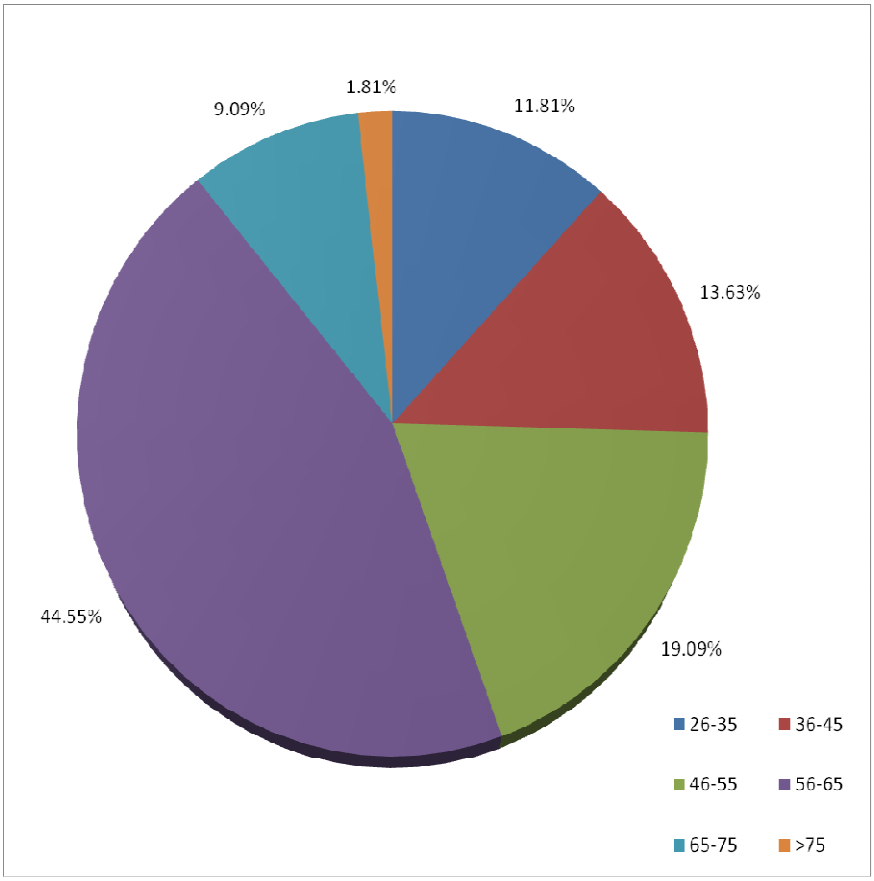
RESULTS

AGE INCIDENCE

AGE IN YEARS	NO OF CASES	PERCENTAGE
26-35	13	11.81
36-45	15	13.63
46-55	21	19.09
56-65	49	44.55
65-75	10	9.09
>75	2	1.81

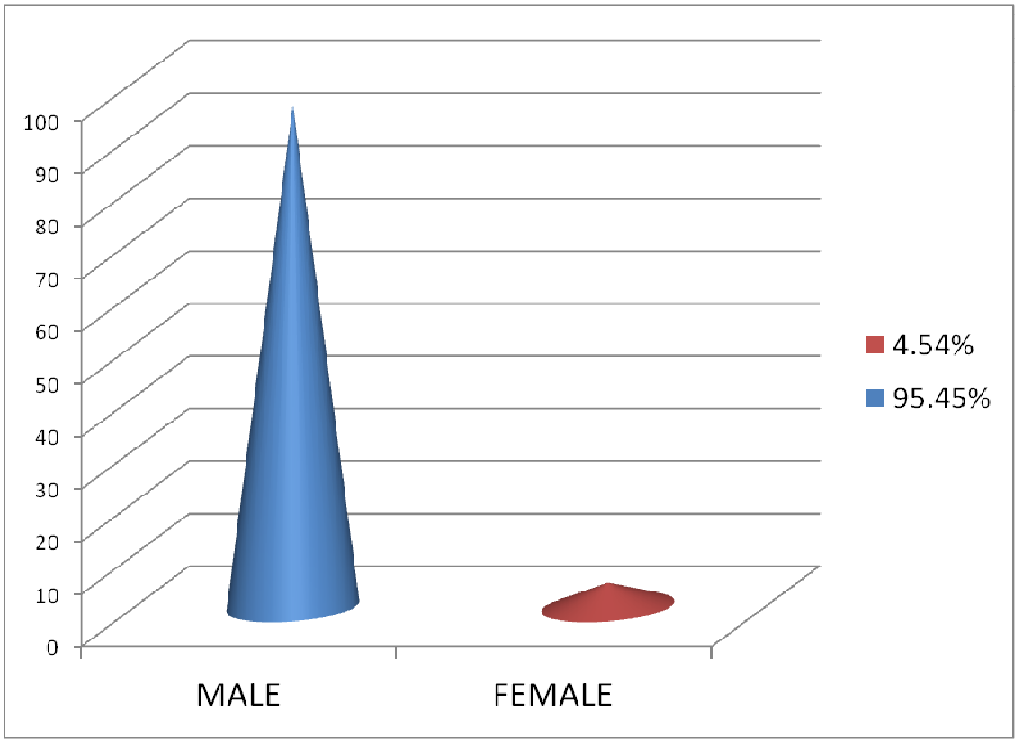
55-65 years is the common age group for complicated inguinal hernias.

AGE INCIDENCE



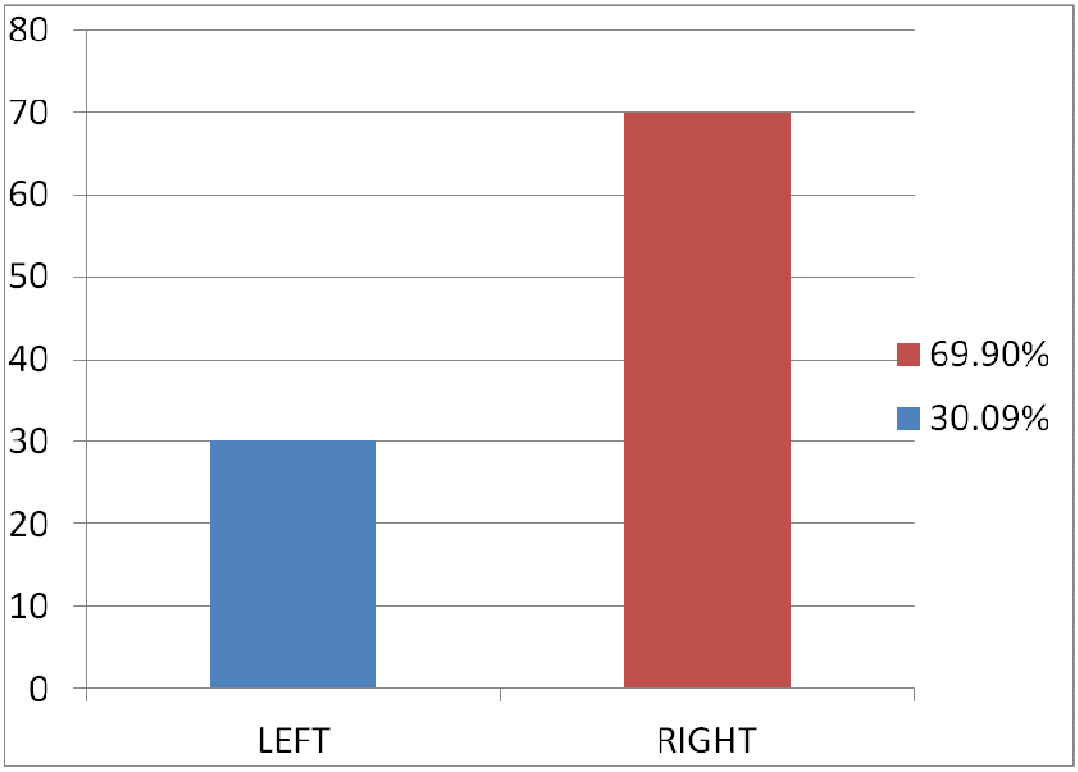
SEX INCIDENCE

SEX	NO OF CASES	PERCENTAGE
MALE	105	95.45
FEMALE	5	4.54



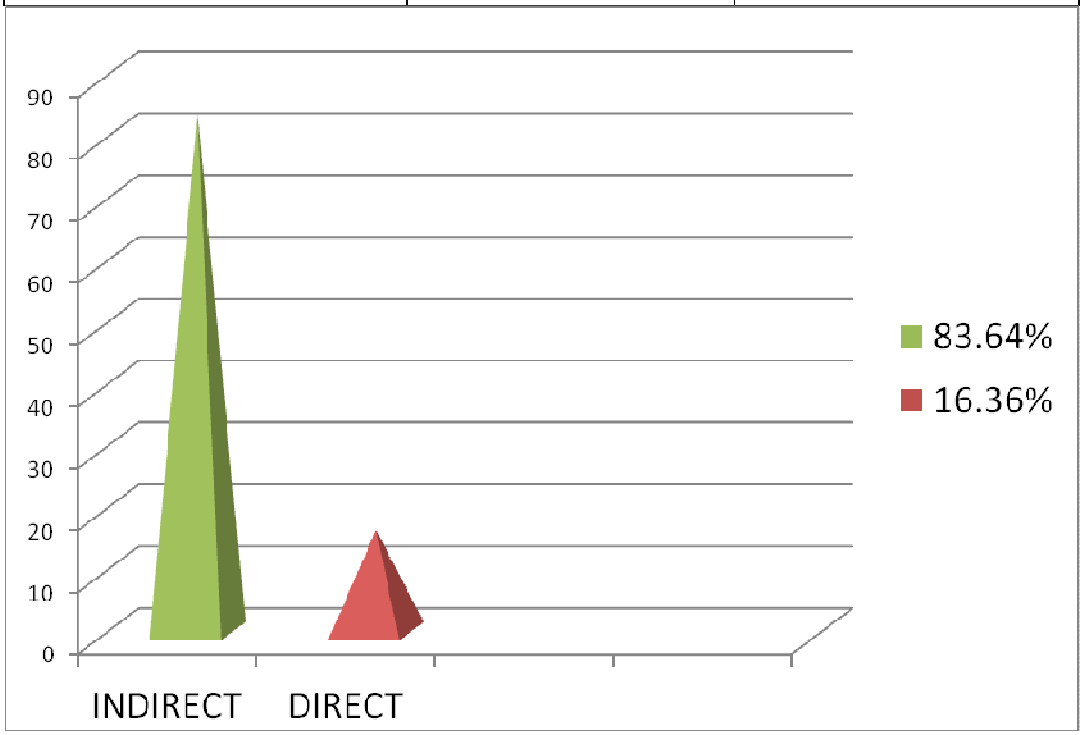
SIDE OF HERNIA DISTRIBUTION

SIDE	NUMBER	PERCENTAGE
RIGHT	76	69.09
LEFT	34	30.90



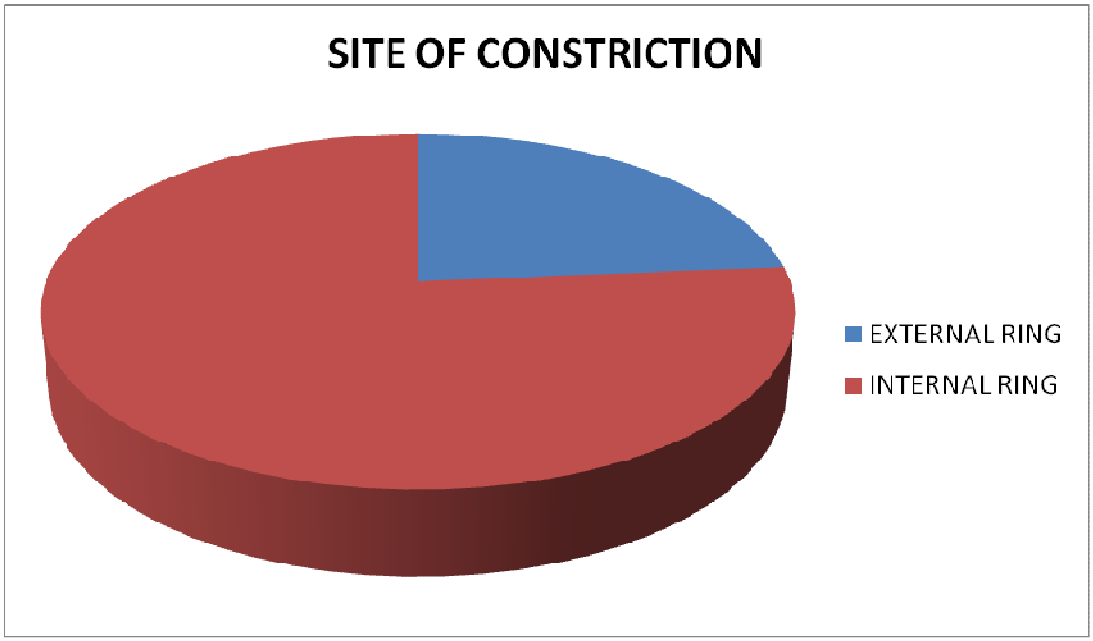
TYPE OF INGUINAL HERNIA TO BE COMPLICATED

TYPE OF HERNIA	TOTAL CASES	PERCENTAGE
INDIRECT	92	83.64
DIRECT	18	16.36



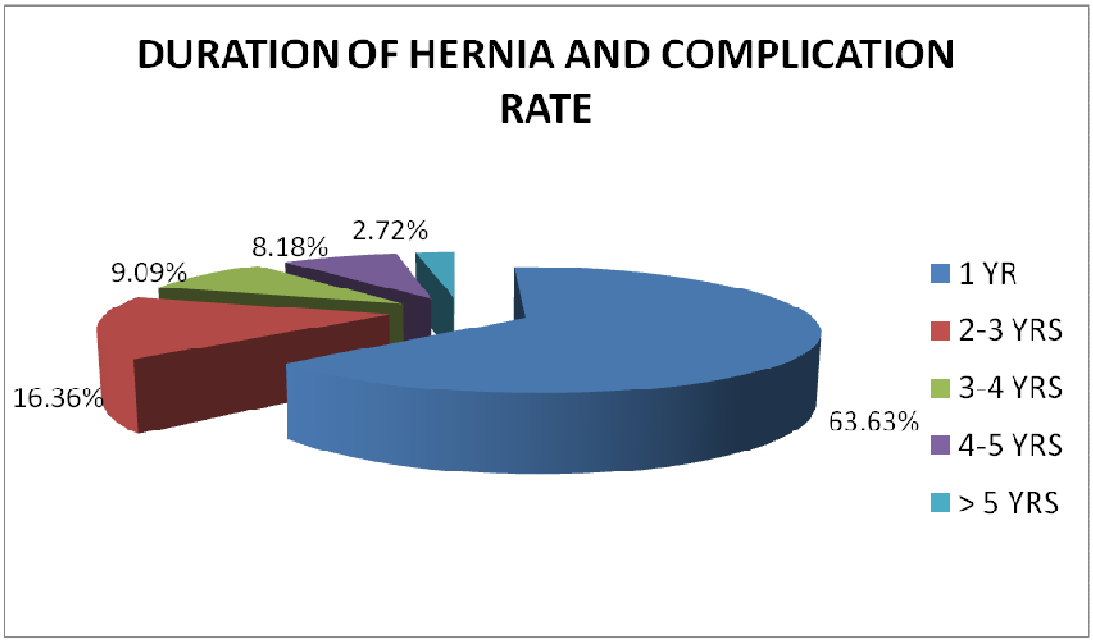
SITE OF CONSTRICTION

SITE OF CONSTRICTION	NO OF CASES	PERCENTAGE
EXTERNAL RING	26	23.63%
INTERNAL RING	84	76.36%



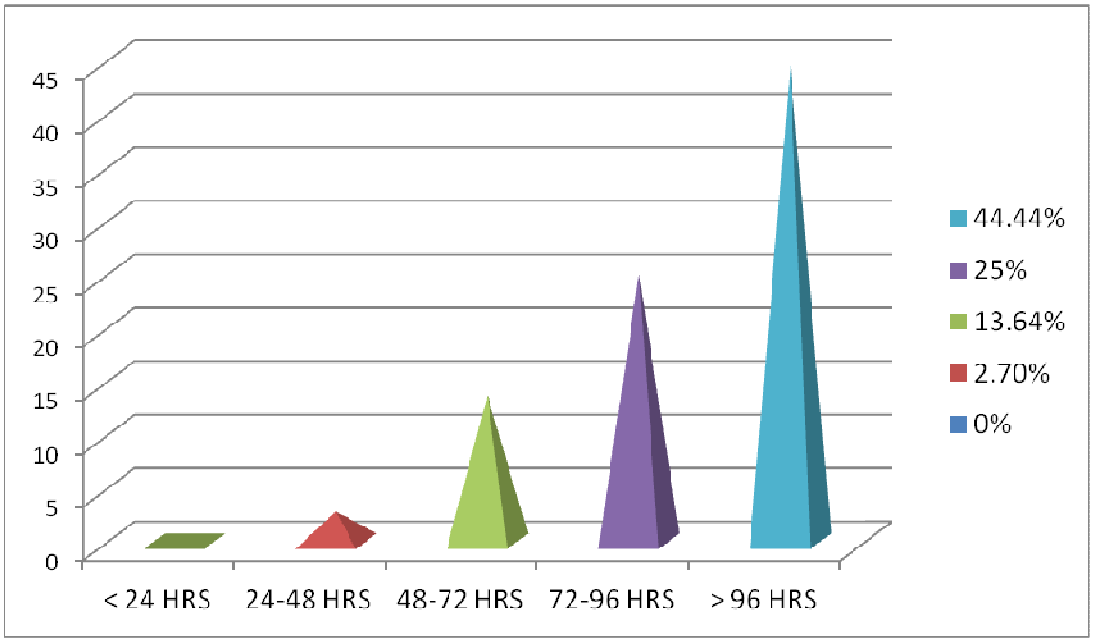
DURATION OF HERNIA AND COMPLICATION RATE

DURATION OF HERNIA	NO OF CASES	PERCENTAGE
1 YEAR	70	63.63
2-3 YEARS	18	16.36
3-4 YEARS	10	9.09
4-5 YEARS	9	8.18
>5 YEARS	3	2.72



DURATION OF IRREDUCIBILITY AND COMPLICATION RATE

DURATION OF IRREDUCIBILITY	NO OF CASES	VIABLE BOWEL	GANGRENOUS BOWEL	%
<24 HRS	14	14	0	0
24-48 HRS	36	35	1	2.78
48-72 HRS	22	19	3	13.64
72-96 HRS	20	15	5	25
>96 HRS	18	10	8	44.44

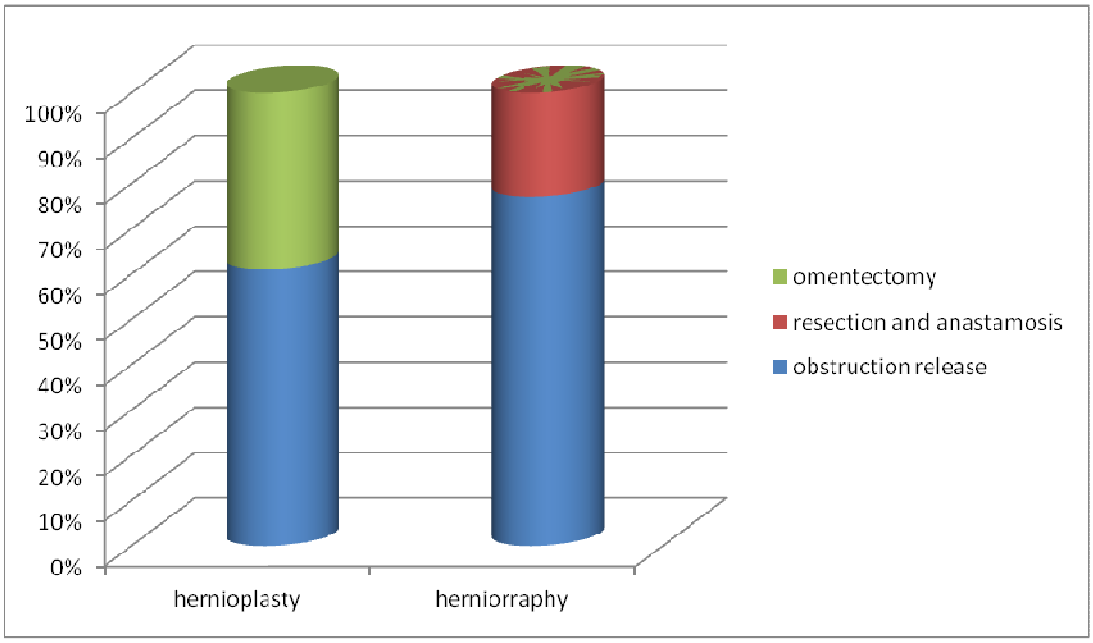


CLINICAL PRESENTATION

SYMPTOMS AND SIGNS	GANGRENOUS CONTENT(N=17)	VIABLE CONTENT(N=93)
ABDOMINAL PAIN	10	90
VOMITING	14	76
ABNORMAL BOWEL HABITS	13	40
ABDOMINAL DISTENTION	10	49

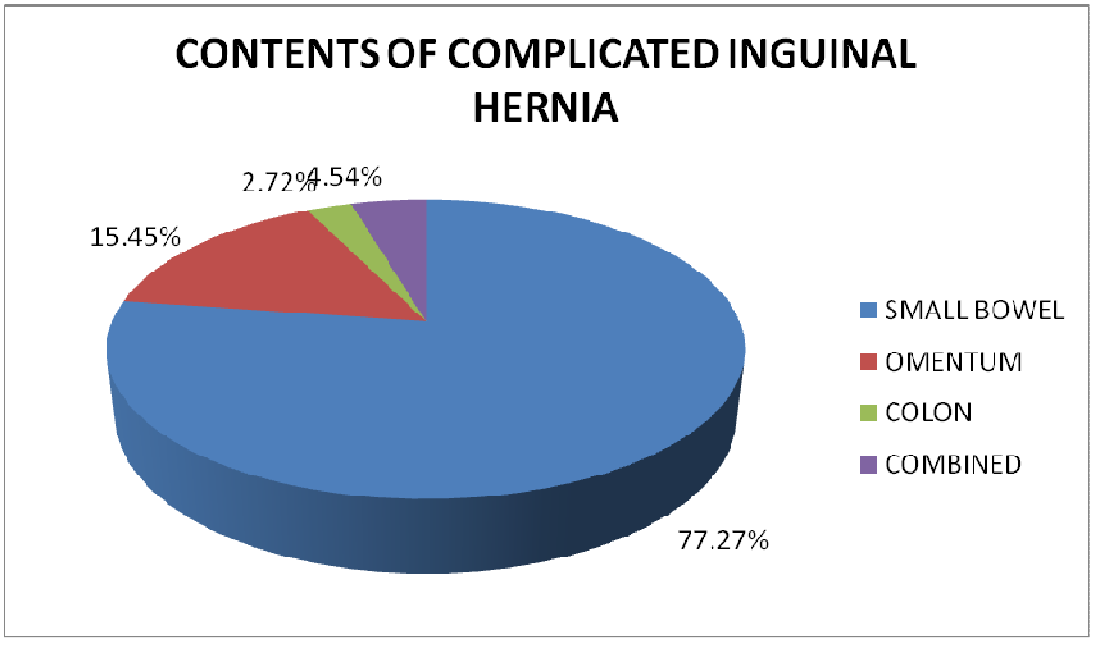
TYPE OF SURGERY PERFORMED

TYPE OF SURGERY PERFORMED	NUMBER OF CASES
Obstruction release and herniorraphy	57
Obstruction release and hernioplasty	22
Resection and anastamosis and herniorraphy	17
Omentectomy and hernioplasty	14



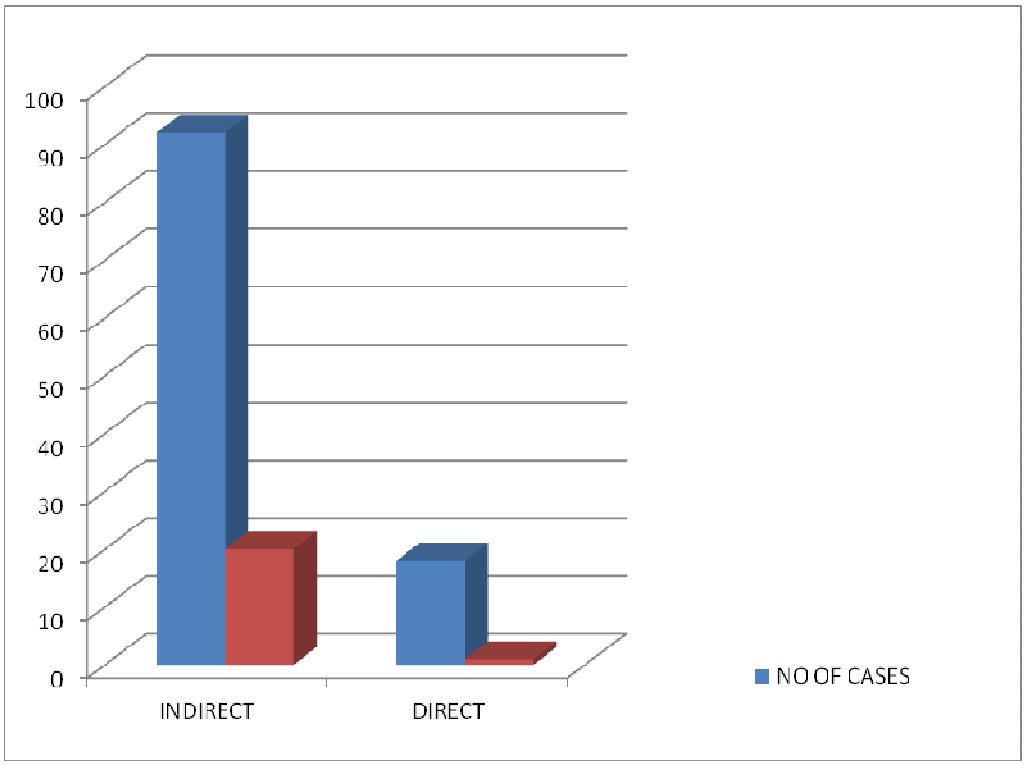
CONTENTS OF COMPLICATED INGUINAL HERNIA

CONTENT	NO OF CASES	PERCENTAGE
SMALL BOWEL	85	77.27
OMENTUM	17	15.45
COLON	3	2.72
COMBINED	5	4.54



EFFECT OF TYPE OF HERNIA ON CONTENTS VIABILITY

TYPE OF HERNIA	NO OF CASES	NO OF GANGRENOUS BOWEL	PERCENTAGE
INDIRECT	92	16	17.39
DIRECT	18	1	5.55



DISCUSSION

In general, among groin hernias inguinal hernias form the largest group. The relative frequency of complication is much higher in the femoral hernia than inguinal hernia. But the largest group is inguinal hernia, so complications in them are observed more frequently than the femoral hernia (Mackenzie 1960). Gallegos (1991) reported that the incidence of complication in inguinal hernia is 3 to 5%.

The aim of this study is to identify the patients with inguinal hernia who are at increased risk of developing complications by analyzing certain risk factors such as age, sex, site of hernia, side of hernia, type of hernia, duration of hernia. For patients who are at increased risk of developing complications should be given priority for admission and early elective surgery to avoid high mortality and morbidity.

AGE INCIDENCE

Risk of developing complications in inguinal hernia is higher in elderly patients. Age was found to be significant risk factor (Rai 1998, Oirhi SN 1991, Askini 2010). According to Alavaruz JA 2004, Maliks 2004 median age for complicated inguinal hernia is 70 years. Bahadais Kulah 2001 found more than 60 years and Romain 2012 found median age of 68 years are increased risk of developing complications in inguinal hernia.

In our study, 55-65 years (median age of 60 years) is the common age group for complicated inguinal hernia.

SEX INCIDENCE

Males are more prone to develop complications in inguinal hernia. Romain 2012 reported significant predominance of men in complicated inguinal hernia group. Bahadais Kulah 2001, Teiman JP were reported male predominance in developing complicated inguinal hernia.

In our study among 110 cases 105 are male and 5 are female patients.

SIDE OF HERNIA

Whether complicated or uncomplicated, inguinal hernia more commonly occurs in the right side. The anatomical basis for this is late descent of right testis compared to left side. NJ Andrews 1998 reported that right sided hernias were more frequently strangulated than left sided hernias.

In our study, 76(69%) patients had right sided hernia and 34(31%) patients had left sided hernia.

TYPE OF HERNIA

Femoral hernias are more prone to develop complications compared to inguinal hernia. In inguinal hernia type, indirect type has high rate of strangulation compared to direct type because of narrowness of the neck of sac.

In our study significant correlation was found between the type of hernia and complications. Out of 98 patients with complicated indirect inguinal hernia, 20 patients (22%) had gangrenous content. Out of 18 patients with complicated inguinal hernia, 1 patient (5%) had gangrenous content.

SITE OF CONSTRICTION

Constriction may occur anywhere along the sac. Constriction more commonly occur along the narrowest part of sac which is the neck of sac. Risk of complication is more in indirect inguinal hernia where the neck of sac is at deep inguinal ring, so constrictions are common in this site.

In our study site of constriction is more inn deep inguinal ring (in 84 patients) compared to superficial inguinal ring (in 26 patients).

DURATION OF HERNIA

Hernias of short duration are more prone to strangulation than the long standing one. This is due to the narrowness of hernia ring when the hernia first appears. As the chronicity increase, gradual yielding and dilatation of hernial orifices occurs, so the risk of developing complication rate decreases. Gallegos 1991 reported probability of strangulation increased in first three months. Rai 1998 stated that risk of developing complication was high if duration of hernia was less than 1 year. Mc Entee 2005

reported risk of developing strangulation within days of developing a hernia.

In this study, 63.6% of patients with inguinal hernia develop complications within one year of appearance of hernia.

DURATION OF IRREDUCIBILITY

Morbidity of patient is affected by viability of contents which in turn directly related to the duration of irreducibility (Rai 1998). Mortality and bowel resection rate was increased with increased duration of symptoms (> 48 hrs, Andrew 1981). Naritaka Tanaka 2010 reported that the time of presentation was significantly longer in resection group.

In our study also the delay in presentation was found to have significant correlation with gangrenous nature of content.

CLINICAL PRESENTATION

Patients with complicated inguinal hernia mostly present with abdominal pain, vomiting, abdominal distention, abnormal bowel habits. In case of obstructed inguinal hernia, patients presented with abdominal pain, vomiting, constipation. Pain mostly

located at the hernia site. In case of internal strangulation pain is located at the level of umbilicus, then pain spreads all over the abdomen and vomiting becomes frequent. Such pain will cease with the onset of gangrene. So, spontaneous cessation of pain is an ominous symptom of gangrene.

In case of strangulated omentocele, symptoms are mostly similar to strangulated enterocele. Vomiting is not so prominent feature. The pain is localized to the hernia site but recurrent attacks of generalized abdominal pain are absent and there is no feature of intestinal obstruction. Strangulated Richter's hernia presents like gastroenteritis. Initially patients present with diarrhea because of the involvement of partial circumference of bowel. If obstruction progresses patient may develop constipation.

Most of the times clinical symptoms alone does not provide adequate details to identify the viability of content. In this study also there is no significant difference in clinical presentation between irreducible and strangulated inguinal hernia.

SURGICAL INTERVENTIONS

In patients presenting with complicated inguinal hernia, the surgical intervention mostly depends upon the viability of content. Andrzei 2006 reported that the use of polypropylene mesh for strangulated inguinal hernia is safe and also risk of local infection rate is low. Campanelli 2004 reported that the prosthetic repair is the gold standard even in potentially contaminated areas, but it should be avoided in infected areas.

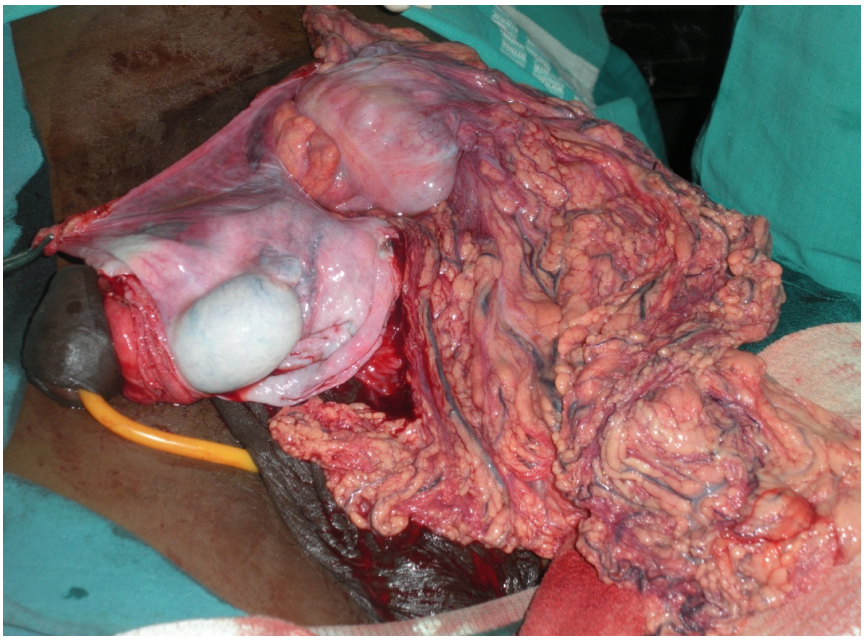
Uguzhan 2008 recommended preperitoneal repair in strangulated hernia and its safety, easy to perform in case of laparotomy where bowel resection is necessary. Hayurullah devici 2010, Mohammed 2012 reported that the mesh repair is safe to perform in acutely incarcerated hernias even if associated with intestinal resection and it also prevents recurrence. The study conducted by Eingest 2003 shows mesh repair is contraindicated only in cases present with colonic necrosis and peritonitis, also recommends good exposure, easy access for resection and safe hernia repair through the same access.

The study conducted by Juni vela 2012 shows strangulated inguinal hernia cannot be considered as a contraindication for mesh repair even in cases of small bowel resection.

In this study we performed resection and anastamosis in case of gangrenous bowel and proceeds with herniorraphy. In case of obstructed inguinal hernia, obstruction was released and depends upon the presence or absence of peritonitis herniorraphy or hernioplasty was done respectively. Most of the herniorraphy procedure is done by using modified Bassini's method. Hernioplasty was done using monofilament polypropylene mesh.

CONTENTS OF SAC

Amos (1852) and Andrew (1981) reported small bowel as the most common content of incarcerated inguinal hernia next thing is omentum. Small bowel is the first one to become content of hernia sac because it is freely mobile intra-abdominal structure and it is easy to occupy the hernia sac. While comparing small intestine with large intestine where ascending colon and descending colon are retroperitoneal structure, they have least chance to become content. If



INTRA OPERATIVE PICTURE SHOWS TRANSVERSE

COLON AS A CONTENT

large intestine get into sac mostly sigmoid or transverse colon may occupy.

Second most common content is greater omentum which is the policeman of abdomen. In this study 85 patients has small intestine as content, 17 has omentum, 3 has colon and 5 has combined either small intestine and colon or small intestine and omentum.

COMORBID CONDITIONS

Most of the patients who presented with complicated inguinal hernia were elderly people so most of them have associated medical illness. Patients presenting with co-morbid conditions have poor outcome when compared with normal patients. There was increase in mortality and morbidity rate in patients with co-morbid conditions.

The study conducted by Alvarez JA 2004, Bahadi Kulah 2001, Aksnii 2010 shows comorbid conditions and high ASA risk have unfavourable outcomes.

MORTALITY AND MORBIDITY

Mortality and morbidity mainly depends upon the duration of symptoms, necessity for bowel resection which indirectly means the viability of bowel and also includes the associated medical illness. Andrew 1981 stated that the mortality rate was increases with increase in duration of symptoms (>48 hours). Nilsion 2010 reported that the incarcerated hernia is the second most common cause of small bowel obstruction and leading cause of small bowel strangulation.

Haapaniemi 1999 stated mortality increase in emergency repair of hernia and in patients who had bowel resection.

In this study five cases died, 3 of them due to associated medical illness 2 of them due to septicemia.

CONCLUSION

In this study we concluded that the elderly male patients presenting with right sided indirect inguinal hernia and with short duration are more prone to develop complications.

The clinical presentation does not differentiate irreducible hernia from strangulated hernia. So without delay patient presenting with complicated inguinal hernia features should undergo emergency surgical repair in view of better outcome.

This study shows the small intestine is the most common content of incarcerated inguinal hernia.

Postoperative outcome of patients mainly depend upon co-morbid conditions and type of surgery performed which indirectly indicates the viability of content.

So those patients with above mentioned risk factors should be treated electively to prevent morbidity and mortality.

SUMMARY

The present study was a prospective study conducted in Department of Surgery in emergency ward of Government Rajaji Hospital, Madurai.

The objective of this study was to find out the risk factors in developing complications in inguinal hernia and identify those patients with risk factors and treat them electively. The study was conducted for the period of one and half years on 110 patients admitted in our emergency ward. An informed and written consent was obtained after explaining the risk and advantages associated with study in their own language. After meeting the inclusion and exclusion criteria patients were subjected to study and results were analyzed.

This study concluded that the elderly male patients presenting with right sided indirect inguinal hernia and with short duration were more prone to develop complications. Postoperative outcome of patients mainly depend upon the viability of bowel and associated co-morbid condition.

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PROFORMA

NAME : **I.P.NO :**

AGE & SEX : **UNIT :**

OCCUPATION :

DATE& TIME OF ADMISSION :

DATE& TIME OF DISCHARGE :

CHIEF COMPLAINTS:

H/O ABDOMINAL PAIN

H/O ABDOMINAL DISTENTION

H/O VOMITING

H/O OBSTIPATION

DURATION OF HERNIA

DURATION OF IRREDUCIBILITY

CLINICAL FINDINGS:

ABDOMINAL TENDERNESS

IRREDUCIBLITY OF HERNIA

ABNORMAL BOWEL SOUNDS

BASIC INVESTIGATIONS:

HAEMOGLOBIN

RENAL PARAMETERS

SERUM ELECTROLYTES

CHEST X RAY PA VIEW

ABDOMEN X RAY ERECT VIEW

INTRA OPERATIVE FINDINGS:

CONTENT OF SAC

SITE OF PATHOLOGY

VIABILITY OF CONTENT

OPERATIVE MODALITY:

POST OPERATIVE OUTCOME:

MASTER CHART

s.no	name	ip no	age	sex	side of hernia	type of hernia	site of constriction	duration of hernia in years	duration of irreducibility in hrs	content of sac	type of surgery
1	santhan	75475	52	m	r	ID	DP	2	24-48	S-V	HP
2	periyasamy	83245	54	m	r	ID	DP	2	24-48	S-V	HP
3	ayyanar	82431	46	m	r	ID	DP	2	24-48	S-V	HP
4	nagappan	23890	48	m	r	ID	DP	2	24-48	S-V	HP
5	gurussamy	45879	49	m	r	ID	DP	2	24-48	S-V	HP
6	Baskar	38756	50	m	r	ID	DP	2	24-48	S-V	HP
7	alavanthan	43890	52	m	r	ID	DP	2	24-48	S-V	HP
8	sundaram	23756	55	m	r	ID	DP	2	24-48	S-V	HP
9	maharajan	89054	51	m	r	ID	DP	2	24-48	S-V	HP
10	arumugam	87696	56	m	r	ID	DP	2	24-48	S-V	HP
11	Arun	32178	58	m	l	ID	DP	4	48-72	O	HP
12	muthupillai	47892	59	m	l	ID	DP	4	48-72	O	HP
13	kesawan	47909	64	m	l	ID	DP	4	48-72	O	HP
14	Bala	11678	63	m	l	ID	DP	4	48-72	O	HP
15	krishnan	38945	61	m	l	ID	DP	4	48-72	O	HP
16	Palani	66895	60	m	l	ID	DP	4	48-72	O	HP
17	Vadivel	45667	65	m	r	ID	DP	4	48-72	O	HP
18	Senthil	33798	63	m	r	ID	DP	4	48-72	O	HP
19	ganesan	45721	59	m	r	ID	DP	4	48-72	O	HR
20	paramasivam	23980	63	m	r	D	S	1	48-72	O	HP

21	jeyapal	34568	29	m	r	D	S	1	<24	S-V	HR
22	Karthik	12678	30	m	r	D	S	1	<24	S-V	HR
23	manikandan	56903	31	m	r	D	S	1	<24	S-V	HR
24	Kalidas	75859	32	m	r	D	S	1	<24	S-V	HR
25	velusamy	83899	34	m	r	D	S	1	<24	S-V	HR
26	Kannan	37804	35	m	r	ID	DP	1	24-48	S-V	HR
27	irulappan	78591	33	m	r	ID	DP	1	24-48	S-V	HR
28	Mani	45850	32	m	r	ID	DP	1	24-48	S-V	HR
29	Raman	23749	31	m	r	ID	DP	1	24-48	S-V	HR
30	saravanan	758023	30	m	r	ID	DP	1	24-48	S-V	HR
31	jeyaraman	87298	66	m	r	ID	DP	1	24-48	S-V	HR
32	kathiresan	744582	68	m	r	ID	DP	1	24-48	S-V	HR
33	sinthamani	45981	72	m	r	ID	DP	1	24-48	S-V	HR
34	matchakalai	84935	73	m	r	ID	DP	1	24-48	S-V	HR
35	rajamani	718784	71	m	r	ID	DP	1	24-48	S-V	HR
36	karmegam	89281	70	m	r	ID	DP	1	24-48	S-V	HR
37	arjunan	34889	73	m	r	ID	DP	1	24-48	S-V	HR
38	Ravi	745590	68	m	r	ID	DP	1	24-48	S-V	HR
39	Suresh	17378	69	m	r	ID	DP	1	24-48	S-V	HR
40	sundaram	833404	66	m	r	ID	DP	1	24-48	S-V	HR
41	Ramesh	638990	36	m	r	ID	DP	3	< 24	S-V	HP
42	Rajesh	`818278	38	m	l	ID	DP	3	<24	S-V	HP
43	Anand	23872	40	m	l	ID	DP	3	<24	S-V	HP
44	Bala	81891	45	m	l	ID	S	3	<24	S-V	HP
45	Durai	74999	42	m	l	ID	S	3	<24	S-V	HP
46	Selvan	12378	43	m	l	D	S	3	<24	S-V	HP
47	triupathy	74853	40	m	l	D	S	3	24-48	S-V	HP

48	Thillai	783899	44	m	l	D	S	3	24-48	S-V	HP
49	Poochi	27637	39	m	l	D	S	3	24-48	S-V	HP
50	Kannan	75409	45	m	r	D	S	3	24-48	S-V	HP
51	Devan	78013	56	m	r	D	S	1	>96	S-NV	RA&HR
52	Pitchai	45789	57	m	r	ID	S	1	>96	S-NV	RA&HR
53	karrupiah	46718	58	m	r	ID	S	1	>96	S-NV	RA&HR
54	marimuthu	75999	59	m	r	ID	S	1	>96	S-NV	RA&HR
55	Muthu	666312	65	m	r	ID	S	1	>96	S-NV	RA&HR
56	mariappan	83482	63	m	r	ID	S	1	>96	S-NV	RA&HR
57	Kali	57012	62	m	r	ID	S	1	>96	S-NV	RA&HR
58	devarajan	75902	64	m	r	ID	DP	1	>96	S-NV	RA&HR
59	Mari	857459	60	m	r	ID	DP	1	48-72	S-V	HR
60	chellaya	59921	63	m	r	ID	DP	1	48-72	S-V	HR
61	karrupan	774975	46	m	r	ID	DP	1	48-72	S-V	HR
62	Sakthi	85981	48	m	r	ID	DP	1	48-72	S-V	HR
63	Rasu	57847	47	m	r	ID	DP	1	48-72	S-V	HR
64	mohammed	577099	50	m	r	ID	DP	1	48-72	S-V	HR
65	Antony	81998	55	m	r	ID	DP	1	48-72	S-V	HR
66	David	49894	54	m	r	ID	DP	1	48-72	S-V	HR
67	Pandi	59858	53	m	r	ID	DP	1	48-72	S-V	HR
68	Vellu	84950	52	m	r	ID	DP	1	48-72	S-V	HR
69	murugan	85781	50	m	r	ID	DP	1	24-48	S-V	HR
70	murugesan	58437	51	m	r	ID	DP	1	24-48	S-V	HR
71	sundaresan	83887	57	m	r	ID	DP	1	24-48	S-V	HR
72	Kumar	832751	59	m	r	ID	DP	1	24-48	S-V	HR
73	velusamy	84758	59	m	r	ID	DP	1	24-48	CO-V	HR
74	Alagan	19838	63	m	r	ID	DP	1	24-48	CO-V	HR

75	Nazeer	37827	62	m	r	ID	DP	1	24-48	CO-V	HR
76	Petchi	873288	64	m	r	ID	DP	1	>96	C-NV	RA&HR
77	Shyed	328882	65	m	r	ID	DP	1	>96	S-NV	RA&HR
78	Moses	83488	63	m	r	ID	DP	1	>96	S-NV	RA&HR
79	Raja	843785	60	m	r	ID	DP	1	>96	S-NV	RA&HR
80	Venkat	83729	61	m	l	ID	DP	1	>96	S-NV	RA&HR
81	Irulan	83291	34	m	l	ID	DP	1	>96	S-NV	RA&HR
82	Sekar	847438	33	m	l	ID	DP	1	>96	S-NV	RA&HR
83	Vinoth	74878	43	m	l	ID	DP	1	>96	CO-NV	RA&HR
84	Prasad	478389	44	m	l	ID	DP	1	>96	CO-NV	RA&HR
85	Sathish	734787	78	m	l	ID	DP	1	>96	O	HP
86	Farid	832487	80	m	l	D	S	1	48-72	C-V	HR
87	Sahul	71884	58	m	l	D	S	1	48-72	C-V	HR
88	Ismail	75790	59	m	l	D	S	1	72-96	S-V	HR
89	arokiyaraj	23445	60	m	l	D	S	1	72-96	S-V	HR
90	venkatesan	23458	60	m	r	D	S	1	72-96	S-V	HR
91	Balaji	342095	61	m	r	D	S	5	72-96	S-V	HR
92	Samy	18298	64	m	r	ID	DP	5	72-96	S-V	HR
93	Palani	23190	65	m	l	ID	DP	6	72-96	S-V	HR
94	ammasi	12324	62	m	l	ID	DP	2	72-96	S-V	HR
95	petchimuthu	34870	64	m	l	ID	DP	2	72-96	S-V	HR
96	Mayil	19823	59	m	l	ID	DP	2	72-96	S-V	HR
97	karthikeyan	23498	60	m	l	ID	DP	2	72-96	S-V	HR
98	Selvam	12349	58	m	l	ID	DP	2	72-96	S-V	HR
99	chinnan	23448	59	m	l	ID	DP	2	72-96	S-V	HR
100	rajasekar	234909	62	m	l	ID	DP	2	72-96	S-V	HR
101	Lingam	324998	58	m	r	ID	DP	2	72-96	S-V	HR

102	Siva	213478	56	m	r	ID	DP	1	72-96	O	HP
103	Elango	12340	57	m	r	ID	DP	1	72-96	O	HP
104	Kasi	14789	59	m	r	ID	DP	1	72-96	O	HP
105	Govind	343788	60	m	r	ID	DP	1	72-96	O	HP
106	lakshmi	648387	44	f	r	ID	DP	1	72-96	O	HP
107	Devi	23880	45	f	r	ID	DP	1	72-96	O	HP
108	shanthi	377789	42	f	l	ID	DP	1	<24	S-V	HP
109	pandiswari	72376	48	f	r	ID	DP	1	<24	S-V	HP
110	Selvi	62377	35	f	l	ID	DP	1	<24	S-V	HP

r- right, l- left, ID- indirect hernia, D-direct hernia, S-superficial ring, DP-deep ring, S-V - small bowel viable, S-NV– small bowel non viable, C-V – colon viable, C-NV – colon non viable, CO-V – combined viable, CO-NV – combined non viable, O- omentum, RA –resection and anastamosis, HR- herniorraphy, HP – hernioplasty

A CLINICAL STUDY OF INGUINAL HERNIA WITH COMPLICATIONS

DISSERTATION SUBMITTED FOR

BRANCH - I M.S (GENERAL SURGERY)

MARCH 2013

THE TAMILNADU

DR.M.G.R.MEDICAL UNIVERSITY

CHENNAI

Ref. No. 00216 /E4/3/2011

Govt.Rajaji Hospital,Madurai.20.
Dated: .01.2012

Institutional Review Board / Independent Ethics Committee.
Dr. A. Edwin Joe, M.D (FM), BL.,
Dean, Madurai Medical College & 2521021 (Secy)
Govt Rajaji Hospital, Madurai 625020.
Convenor
grhethcssecy @gmail.com.

Sub: Establishment-Govt. Rajaji Hospital, aMadurai-20-
Ethics committee-Meeting Agenda-communicated-regarding.

The next Ethics Committee meeting of the Govt. Rajaji Hospital, Madurai was held at 11.00 Am to 1.00Pm on 27.01.2012 at the Dean Chamber, Govt. Rajaji Hospital, Madurai. The following members of the committee have been attended the meeting.

1. Dr.N.Vijayasankaran,M.ch(Uro.) 094-430-58793 0452-2584397	Sr.Consultant Urologist Madurai Kidney Centre, Sivagangai Road,Madurai	Chairman
2. Dr.P.K. Muthu Kumarasamy, M.D., 9843050911	Professor & H.O.D of Medical, Oncology(Retired)	Member Secretary
3. Dr.T.Meena,MD 094-437-74875	Professor of Physiology, Madurai Medical College	Member
4. Dr. S. Thamilarasi, M.D (Pharmacol)	Professor of pharmacology	
5.Dr.Moses K.Daniel MD(Gen.Medicine) 098-21-56066	Professor of Medicine Madurai Medical College	Member
6.Dr.M.Gobinath,MS(Gen.Surgery) 097-871-50010	Professor of Surgery Madurai Medical College	Member
7.Dr.S.Dhishath, MD(O&G)	Professor of OP&GYN Madurai Medical College	Member
8.Dr.S.Vadivel Murugan., M.D. 097-871-50010	Professor of Medicine Madurai Medical College	Member
9.Shri.M.Sridher,B.sc.B.L. 099-949-07400	Advocate, 623-B.II.Floor,East II Cross, K.K.Nagar,Madurai.20.	Member
10.Shri.O.B.D.Bharat,B.sc., 094-437-11162	Businessman Plot No.588, K.K.Nagar,Madurai.20.	Member
11.Shri. S.sivakumar,M.A(Social) Mphil 093-444-84990	Sociologist, Plot No.51 F.F, K.K. Nagar, Madurai.	Member

Following Projects were approved by the committee

Sl. No	Name of P.G	Course	Name of the Project	Remarks
1.	TV. Subha,	PG. M.S (genl Surg)	Inguinal hernia with complications; a clinical study.	Approved

Please note that the investigator should adhere the following: She/He should get a detailed informed consent from the patients/participants and maintain Confidentially.

1. She/He should carry out the work without detrimental to regular activities as well as without extra expenditure to the institution to Government.
2. She/He should inform the institution Ethical Committee in case of any change of study procedure site and investigation or guide.
3. She/He should not deviate for the area of the work for which applied for Ethical clearance.

She/He should inform the IEC immediately, in case of any adverse events pr Serious adverse reactions.

4. She/he should abide to the rules and regulations of the institution.
5. She/He should complete the work within the specific period and apply for it any Extension of time is required She should apply for permission again and do the work.
6. She/He should submit the summary of the work to the Ethical Committee on Completion of the work.
7. She/He should not claim any funds from the institution while doing the word or on completion.
8. She/He should understand that the members of IEC have the right to monitor the work with prior intimation.

22/12

DEAN

To
All the above members and Head of the Departments concerned.
All the Applicants.

Professor and Head
Department of Surgery
MADURAI MEDICAL COLLEGE
Govt Raj Jr Hospital
Madurai-20